1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

B

Approximate Theory of Elastic-Plastic Deformations of Shells with Axial Symmetry, A. A. Ilyushin. 20 pages. 1947. Graduate Division of Applied Mathematics, Brown University, Providence, R.I. (Translation RMB-28.) From *Prikladnaia Matematika i Mekhanika*, 1944, p. 15-24.

A mathematical development.

Vol. 8, No. 1,

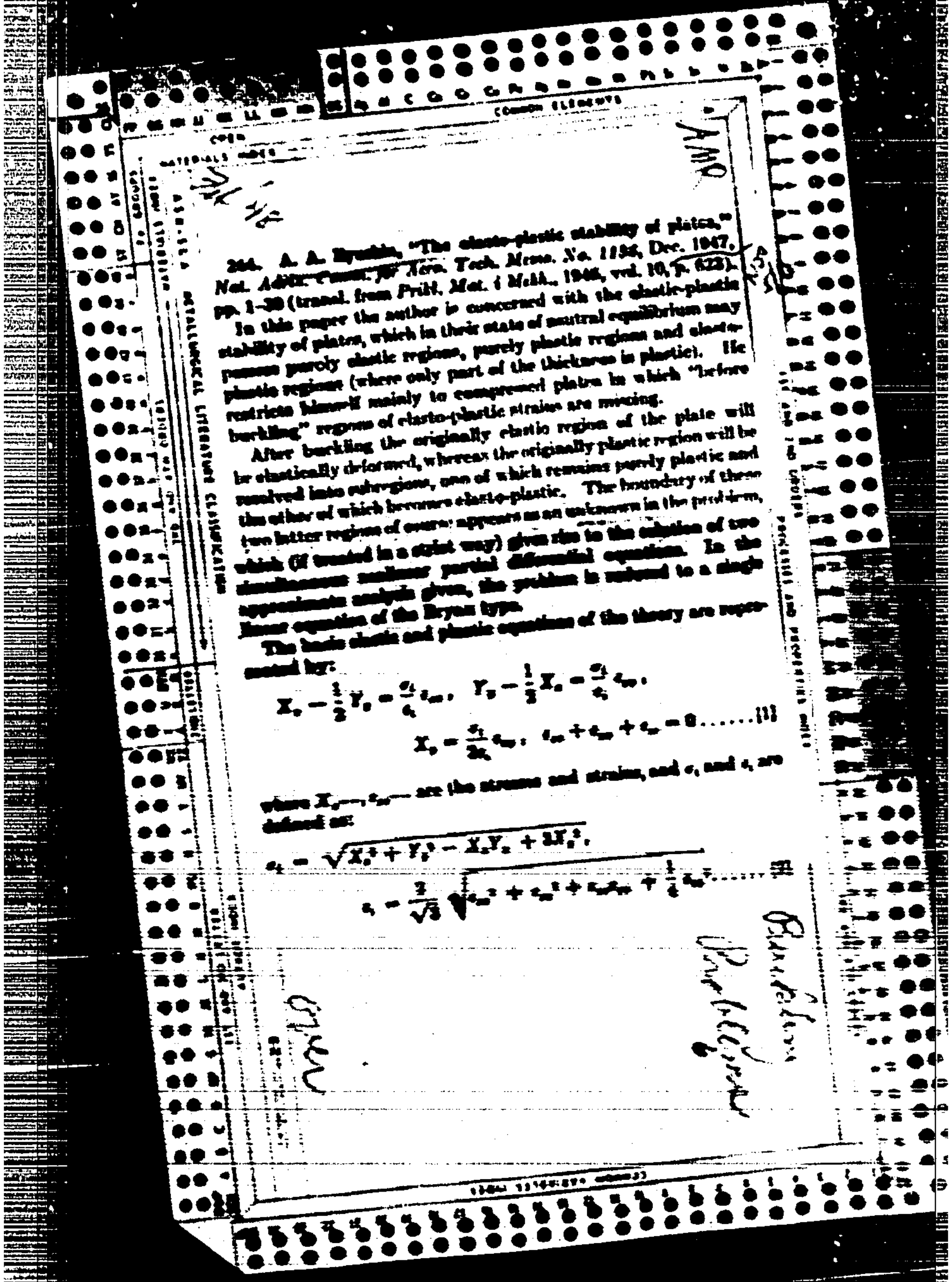
ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

IL'YUSHIN, A. A.

"A Finite Relation Between the Forces and Moments and Their Connection with the Deformation in the Theory of Shells," Prik. Mat. i Mekh. No.9, pp. 101-110, 1945

IL'YUSHIN, A. A.

"The Relation Between the Theory of St. Venant-Levy-Mises and the Theory of Small Elastic-Plastic Deformations," Prik. Mat. i Mekh., No.9, pp. 207-218, 1945



ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

AMD

7/1 48

364. A. A. Ilyushin, "The elasto-plastic stability of plates," Nat. Advis. Comm. for Aero. Tech. Mem. No. 1188, Dec. 1947, pp. 1–30 (transl. from Prikl. Mat. i Mekh., 1946, vol. 10, p. 623).

In this paper the author is concerned with the elastic-plastic stability of plates, which in their state of neutral equilibrium may possess purely elastic regions, purely plastic regions and elasto-plastic regions (where only part of the thickness is plastic). He restricts himself mainly to compressed plates in which "before buckling" regions of elasto-plastic strains are missing.

After buckling the originally elastic region of the plate will be elastically deformed, whereas the originally plastic region will be resolved into subregions, one of which remains purely plastic and the other of which becomes elasto-plastic. The boundary of these two latter regions of course appears as an unknown in the problem, which (if treated in a strict way) gives rise to the solution of two simultaneous nonlinear partial differential equations. In the approximate analysis given, the problem is reduced to a single linear equation of the Bryan type.

The basic elastic and plastic equations of the theory are represented by:

$$X_x - \frac{1}{2}Y_y = \frac{\sigma_i}{e_i}e_{xx}, \quad Y_y - \frac{1}{2}X_x = \frac{\sigma_i}{e_i}e_{yy},$$

$$X_y = \frac{\sigma_i}{3e_i}e_{xy}, \quad e_{xx} + e_{yy} + e_{zz} = 0 \ldots\ldots (1)$$

where $X_x, \ldots, e_{xy}$ are the stresses and strains, and σ_i and e_i are defined as:

$$\sigma_i = \sqrt{X_x^2 + Y_y^2 - X_xY_y + 3X_y^2},$$

$$e_i = \frac{2}{\sqrt{3}}\sqrt{e_{xx}^2 + e_{yy}^2 + e_{xx}e_{yy} + \frac{1}{4}e_{xy}^2} \ldots\ldots (2)$$

Buckling Problems

Over

In the elastic region σ_i must be put equal to $3Ge_i$. Beyond the elastic limit σ_i must be looked upon as a function of e_i, which has to be determined in advance for each individual material. It appears from both Equations [1] and [2] that the material is considered subject to the condition of constant volume in every state of stress.

The paper is divided into three sections. In the first the author derives expressions for the forces and moments in terms of the strains in the middle surface of a shell. In the second he sets up a general theory for the stability of compressed plates. In the third section the author discusses some special cases, including: the stability of a plate of arbitrary shape under equal biaxial compression; buckling into cylindrical shape of a rectangular plate under uniaxial stress or strain; and a plate in a uniform state of stress before buckling.

C. B. Biezeno, Holland

IL'YUSHIN, A. A.

USSR/Academy of Sciences May 48
Engineering Sciences

"In the Department of Technical Sciences" 4 pp

"Vest Ak Nauk SSSR" No 5

At the Feb session, two reports were submitted: A. A. Il'yushin's "Theory of Small Plastic Deformations and Its Application," and Yu. N. Rabotnov's "Theory of Creep in Metals and Its Application to Parts Design." Works of separate institutions making up Dept of Tech Sci were reviewed by the bureau of the department.

53/49T6

IL'YUSHIN, A. A.

PA 12/49T43

USSR/Engineering
Plastic deformation Jun 48

"The Theory of Elastic Plastic Deformation and Its Application," A. A. Il'yushin, Corr Mem Acad Sci USSR, Inst of Mech, Acad Sci USSR, 20 pp

"Iz Ak Nauk SSSR, Otdel Tekh Nauk" No 6

Treats subject under following headings: (1) theory; (2) some very simple problems; (3) equilibrium of laminae and envelopes; (4) rigidity of laminae and envelopes; (5) presswork; (6) dynamic problems. Submitted 26 Mar 48.

12/49T43

IL'YUSHIN, Aleksey Antonovich

M: Za chest' otechestvennoy nauki i tekhniki (In Honor of Native Science and Technology); Moskva; 1949

Abstracted in USAF "Treasure Island", on file in Library of Congress, Air Information Division, Report No. 97774, Unclassified.

LEYUSHIN, A.A.

IL'YUSHIN A. A.

PA 157T82

USSR/Physics - Plasticity
Deformation Dec 49

"Some Basic Problems in the Theory of Plasticity," A. A. Il'yushin, Corr Mem, Acad Sci USSR, 21 pp

"Iz Ak Nauk SSSR, Otdel Tekh Nauk" No 12

Outlines methods for investigating technical problem of plasticity, reviews criticism on subject, and briefly describes those directions in which, in Il'yushin's opinion, the theory of plastic deformation must be developed.

[redacted]

157T82

IL'YUSHIN, A. A.

USSR/Metals - Modeling of Pressure-Working Jul/Aug 52

"Modeling of the Heating and Velocity Processes in the Working of Metals by Pressure," A. A. Il'yushin, Moscow, Inst of Mech, Acad Sci USSR

"Prik Matemat i Mekh" Vol XVI, No 4, pp 385-418

Applies the laws of similitude and dimensional analysis to the theory of metal working by pressure, using quant graphical dependences of stress on strain.

225T35

GUBKIN, S.I., deystvitel'nyy chlen; IL'YUSHIN, A.A., chlen-korrespondent.

Studying on a small scale of the hot and rapid processes of shaping metals by pressure. Remarks concerning the article by A.A.Il'iushin, corresponding member of the Academy of Sciences of the U.S.S.R. Izv.AN SSSR Otd. tekh.nauk no.4:533-542 Ap '53. (MLRA 6:8)

1. Akademiya nauk Belorusskoy SSR (for Gubkin). 2. Akademiya nauk SSSR (for Il'yushin). (Metalwork)

IL'YUSHIN, A. A.

7538 IL'YUSHIN, A. A., RABOTNOV, YU. N. INZHENERNYY. SBORNIK. (OTV. RED.
A. A. IL'YUSHIN, YU. N. RABOTNOV). M., IZD. VO AKAD. NAUCH SSSR, 1954,
26 SM. (AKAD. NAUK. SSSR. OTD. NIYE TEKHN. NAUK. IN. T MEKHANIKI). T. 20
184 S. S. ILL. 2.500 EKZ. 90 R. 80 K. --BIBLIOGR: V KONTSE STATEY.--
(55-943 ZH)

SO: KNIZHNAYA LETOPIS --Vol. 7, 1955

USSR/Physics - Plastic flow

FD-635

Card 1/1 : Pub. 85 - 2/12

Author : Il'yushin, A. A. (Moscow)

Title : Problems in the theory of the flow of plastic substance over surfaces

Periodical : Prikl. mat. i mekh., 18, 265-288, May/Jun 1954

Abstract : Mathematically describes and calculates the plastic flow (finite deformations) of bodies that possess the form of comparatively thin-walled shells and that have been subjected to one of the types of pressure treatment. States that the essential difficulties in setting up this problem are the selection of the fundamental kinematic hypotheses and the hypotheses relating to contact friction on rigid surfaces.

Institution : Institute of Mechanics, Academy of Sciences of the USSR

Submitted : March 8, 1954

ILYUSHIN, A-A

[illegible] the [illegible]

NIKIFOROV, Sergey Nikolayevich, professor, doktor tekhnicheskikh nauk
IL'YUSHIN, A.A., professor, doktor fiziko-matematicheskikh nauk
retsenzent; BEZUKHOV, N.I., professor, doktor tekhnicheskikh
nauk, retsenzent; AFANAS'YEV, A.M., kandidat tekhnicheskikh
nauk, redaktor; TUMARKIN, D.M., inzhener, redaktor; MEDVEDEV,
L.Ya., tekhnicheskiy redaktor; VOLKOV, V.S., tekhnicheskiy redaktor.

[Theory of elasticity and plasticity] Teoriia uprugosti i plastichnosti. Moskva, Gos.izd-vo lit-ry po stroitel'stvu i arkhitekture, 1955. 284 p. (MLRA 8:12)

1. Chlen-korrespondent AN SSSR (for Il'yushin)
(Elasticity) (Plasticity)

Il'yush

LEYBENZON, Leonid Samuilovich, 1879-1951 (deceased); NEKRASOV, A.I., akademik; TIKHONOV, A.N.; IL'YUSHIN, A.A.; SOKOLOVSKIY, V.V.; GALIN, L.A.; SHCHELKACHEV, V.N., doktor tekhnicheskikh nauk; TREBIN, F.A., doktor tekhnicheskikh nauk; GRIGOR'YEV, A.S., kandidat tekhnicheskikh nauk; SEDOV, L.I., akademik, redaktor; ZVOLINSKIY, N.V., professor, redaktor; ALEKSEYEVA, T.V., tekhnicheskiy redaktor.

[Collected works] Sobranie trudov. Moskva, Izd-vo Akademii nauk SSSR. Vol.4[Hydroaerodynamics. Geophysics] Gidroaerodinamika. Geofizika. 1955. 398 p. (MIRA 8:11)

1. Chlen-korrespondent AN SSSR (for Tikhonov, Il'yushin, Sokolovskiy, Galin)
(Geophysics) (Fluid dynamics)

LEYBENZON, Leonid Samuilovich, akademik; NEKRASOV, A.I., akademik; TIKHONOV, A.N.; IL'YUSHIN, A.A.; SOKOLOVSKIY, V.V.; SHCHELKACHEV, V.N., doktor tekhnicheskikh nauk; TREBIN, F.A., doktor tekhnicheskikh nauk, redaktor; GALIN, L.A.; GRIGOR'YEV, A.S., doktor tekhnicheskikh nauk; CHARNYY, I.A., doktor tekhnicheskikh nauk, redaktor; ALEKSEYEVA, T.V., tekhnicheskiy redaktor.

[Collected works] Sobranie trudov. Moskva, Izd-vo Akademii nauk SSSR. Vol.3.[Petroleum engineering] Neftepromyslovaia mekhanika 1955. 678 p. (MLRA 8:10)

1. Chlen-korrespondent AN SSSR (for Tikhonov, Il'yushin, Sokolovskiy and Galin)
(Petroleum engineering)

[illegible] the theory of plasticity [illegible]

Il'yushin, A. A.

"Complete Plasticity in the Process of Flow Between Rigid Surfaces, Analogy with Sand Banks, and Several Applications", Prikladnaya Matematika i Mekhanika, 1955, Vol 19, Nr 6, pp 643-713.

IL YUSHIN A. A

USSR/Physics - Plasticity FD-3088

Card 1/1 Pub. 85 - 3/16

Author : Il'yushin, A. A. (Moscow)

Title : ~~Complete plasticity~~ in flow processes between rigid surfaces, analogy with a sand embankment, and certain applications

Periodical : Prikl. mat. i mekh., 19, Nov-Dec 1955, 693-713

Abstract : In pressure working of metals flow of the plastic substance occurs in the form of comparatively thin layer between two moving rigid surfaces, and the obtained article is a sheet or shell of constant or variable thickness with profiled local ribs or bulges. In an earlier work ("Problems in the theory of flow of plastic substance along surfaces," ibid., 18, No 3, 1954) the author set up mathematically the general problem of flow of plastic substance along surfaces and obtained simplified equations and a number of concrete results, the main one being that in these processes the internal tangential stresses in the layer turn out to be small in comparison with the normal stresses (so-called conditions for complete plasticity) and that the transverse velocities of flow of particles in an elementary normal column of height equal to the layer differ but little among themselves and can be considered identical (so-called kinematic condition). In the present work the author develops these ideas. Two ref.: e.g. Ye. P. Unksov, Inzhenernyye metody rascheta usiliy pri obrabotke metalla davleniyem [Engineering methods of calculating forces in working of metals by pressures], Machine Press, 1955

Submitted : September 5, 1955

IL'YUSHIN,A.A.

Modern problems in the theory of plasticity. Vest.Mosk.un.
no.45:101-113 Ap-My '55. (MLRA 8:8)
(Plasticity)

IL'YUSHIN, A.A., prof.

[Program in the theory of elasticity; for the Mechanics-Mathematics Faculty] Programma po teorii uprugosti dlia mekhaniko-matematicheskogo fakul'teta. Spetsial'nost' - mekhanika. 1956. 2 p. (MIRA 11:3)

1. Moscow. Universitet.
(Elasticity)

[illegible] VIKSHIN A-A

SOV/137-58-10-21521

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 152 (USSR)

AUTHOR: Il'yushin, A. A.

TITLE: Some Approximate Solutions of Problems of the Theory of Plastic Flow (Nekotoryye priblizhennyye resheniya zadach teorii plasticheskogo techeniya)

PERIODICAL: V sb.: Inzhenern. metody rascheta tekhnol. protsessov obrabotki metallov davleniyem. Moscow-Leningrad, Mashgiz, 1957, pp 20-33

ABSTRACT: The problem of deformation of a layer situated between two rigid surfaces is analyzed. This problem may be likened to a problem on the deformation of a layer of a "hard" fluid. In setting up equilibrium equations, the following simplifying assumptions are introduced: 1) The normal pressure, p_k, is uniform along the contour of a section parallel (tangential) to the surface of contact with the tool in a certain small region; 2) in a section perpendicular to the contact surface the specific pressure, p, on the surfaces of contact with the tool exceeds the p_k by a value equivalent to σ_B; 3) the p_k diminishes in the direction of the flow of material; 4) the

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SOV/137-58-10-21521

Some Approximate Solutions of Problems (cont.)

tangential stress on the surface of contact with the tool has a value of $\tau_{contact} = \sigma_s / 2$. The equilibrium equation is set up in curvilinear coordinates on a plane passing through the middle of the layer of material. A complicated, non-linear, partial differential equation is obtained. To effect a simple solution, use is made of an analogy between the contact pressures and the ordinates of a sand fill. Examples are given for computation of non-plane plates with curvilinear surfaces. By employing the process of rolling of threads as an example, the author examines the conditions for filling in of metal and the relationship existing between the pressure and the completeness of thread formation along the length of a bolt. Also examined are two instances in which the process of machining of metal is affected by the heat exchange between the tool and the material being subjected to hot deformation, namely, when there is a temperature drop between the tool and the metal of the workpiece and the influence of friction on the amount of heat produced during operations involving an elevated strain rate.

1. Plastic flow--Theory 2. Mathematics--Applications V. O.

Card 2/2

24-1-1/26

Creep of austenitic steel in the case of complicated stress states.

means of the theory of creep which represents a further development of the theory of flow of Il'yushin, A.A. (Ref.3), Malinin, N. N. (Ref.4) and also of the theories of Soderberg, C.R. (Ref.5), Marin, J. (Ref.6) and Odquist, F. (Ref.7). On the basis of a number of special experiments, Bailey, R.W. (Ref.8) recommends a different formula for calculating three-dimensional creep, whilst Johnson, A. E. (Refs.9 and 10) recommends another formula. Eq.(1) contains only two constants A and n, which can be determined from creep tests in tension. The formula of Bailey contains a larger number of constants, which have to be determined from creep tests at a different stress state, whilst the equations of Johnson are more cumbersome and less convenient for practical calculations. Creep tests, carried out by Bailey and Johnson (Refs.8-10), in tension and in torsion on thin walled tubular specimens fundamentally confirm the here expressed views. However, the duration of these tests was only 150 hours which is not long enough. In this paper the results are described of long duration creep tests under complex stress conditions at a temperature of 600°C. The experiments

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were effected in a special test rig described in earlier work (Ref.11) in which 32/20 tubes (as shown in Fig.1) of current industrial manufacture were subject to the effect of a constant tension and a constant torsion moment. The specimens were made of austenitic steel with the following composition: 0.09% C, 0.78% Mn, 0.36% Si, 0.010% S, 0.018% P, 17.18% Cr, 10.68% Ni, 0.47% Ti. The heat treatment consisted of annealing for thirty minutes at 1100°C followed by cooling in air (austenisation), each specimen was subjected solely to a single experiment with a constant ratio of the tensile stresses, σ, to the torsion stresses, τ. The following τ to σ ratios were chosen: $\tau/\sigma = \infty$, 2.0, 1.0, 0.6, 0.5, 0.4, 0.3, 0; for each τ to σ ratio at least two specimens were tested. The duration of a single test depended on the magnitude of the applied stresses; in each case the experiments were continued until the steady state second section of the creep curve was reached. Most experiments lasted 1500 to 2000 hours during which usually a constant creep speed became established. This duration is also adequate from the point of view of overcoming the period of most intensive ageing. Some experiments lasted less

than 1000 hours, namely, in the case of stresses at which a transition to the third stage of creep obviously took place. The results are entered in Table 1 and graphed in Figs.2-8. The experimentally determined values are compared with values calculated by means of Eq.(1) in Table 2, p.9; on the average the experimentally determined creep speeds are 2.5 to 3 times as high as the values calculated by means of Eq.(1). The authors of this paper propose using for the same purpose Eqs.(6) and (7), p.5.
The authors arrived at the following conclusions:

1. The experimental results confirm the applicability of the creep theory which is based on the theory of plastic flow for describing the process of steady state creep for durations up to 2000 hours.
2. The stress calculations for components operating under creep conditions with a complex stress state can be effected on the basis of creep test results in tension but it is necessary to improve the accuracy of the experimentally determined calculation coefficients for each group of materials under consideration.
3. A material which is under creep stress conditions in tension and torsion generally complies with the criterion

Creep of austenitic steel in the case of complicated stress states.

of plastic flow of Hankey. However, the relation $v_i = F(\tau_i)$ is not entirely fulfilled since the tension and torsion curves are not identical in octahedric coordinates.
4. In the case of low creep speeds, the most accurate and theoretically the most justified is an exponential dependence between the speed of creep and the stress. This relation is correct for all the investigated types of stress states. The speed of steady state three-dimensional creep should be calculated in accordance with Eq.(6), p.5.
5. For the tested austenitic steel 1X18H9T, the power dependence between the creep speed and the stress for a temperature of 600°C approximates satisfactorily the exponential dependence for a wide range of creep speeds (from 10^{-4}%/hr and higher) and, therefore, the exponential dependence can be used for practical calculations since it is simpler and more convenient.
6. Creep tests of the austenitic steel 1X18H9T in tension and torsion did not confirm the assumption of coincidence of the directions of the main stresses and the main axes of the deformation speeds over long periods. In the

case of non-uniaxial stress states, a redistribution of the main creep speeds is observed whereby the creep speeds in the main directions v_1 and v_2 are equalised and the creep speed in the third main direction, v_3, tends to become zero.

7. Under conditions of long duration tests, the creep theory, which is based on the assumption of isotropic behaviour of real commercial alloys, requires corrections which can be established by studying the physical nature of creep in the case of complicated stress states.

There are 2 tables, 8 figures and 12 references - 6 Russian, 6 English.

SUBMITTED: March 6, 1957.

AVAILABLE: Library of Congress.

IL'YUSHIN, A.A.

AUTHOR: Il'yushin, A.A. (Moscow). 24-2-10/28

TITLE: Certain problems in the theory of plastic flow. (Nekotoryye voprosy teorii plasticheskogo techeniya).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, No.2, pp. 64-86 (USSR).

ABSTRACT: The paper, read at a commemorative session of the Soviet Academy of Sciences, reviews the foundations of plastic flow theory. Choosing the Euler approach, the basic equations of the plastic flow of metals are stated. The variation of density depends mainly on the pressure. The proposition, whose verification was established by the author ("On the Relation Between Stresses and Small Deformations in the Mechanics of Continuous Media", Prikladnaya Matematika i Mekhanika, 1954), is made use of, by which the principal axes of the shear deformations and stresses coincide. From this follows an expression for the elementary work performed by the stresses acting on a unit volume of material. The degree of deformation is a scalar quantity which determines this elementary work together with the relative variation of volume. Of basic importance are two relations expressing the scalar quantities of mean pressure and shear stress in terms of

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the change of volume, the temperature, the degree of deformation and the time. These relations, in the form of functionals are the equations of state of the material. They are a field of study in the physics of solids with many gaps in present knowledge. In the press-forming of metals, large shear deformations are associated with temperatures below 1,000°C and pressures are limited by press capacity. The degree of deformation in these conditions far exceeds thermal volume changes or those due to phase transformations. The pressure functional is then replaced by the relation expressing incompressibility. The other basic equation of state has a generalised simplified form, Eq.(1.18). Its particular forms are derived from simple tests, e.g. the tension of cylindrical specimens. Typical groups of such relations are stated, of which the most important is Eq.(1.21) when the degree of deformation is large and important, Eq.(1.22) when the deformation is small and the rate of deformation unimportant, and Eq.(1.24) when the degree of deformation is unimportant. Finally, the case of creep is typically represented by Eq.(1.28). The general equations of plastic flow are set up for the case when the

Certain problems in the theory of plastic flow. 24-2-10/28

velocity head is everywhere below the minimum shear stress. At the highest temperatures of steel forging with yield stresses in the order of 2 kg/mm^2, the condition is fulfilled below deformation rates of hundreds of m/sec. The complete system of the equations of motion and boundary conditions of plastic flow (namely Eqs.(2.3), (2.8), (2.9), (2.10), (2.11) and (2.12)) is the analogue of a corresponding system of equations in the theory of small elasto-plastic deformations. From this analogy a theorem is derived leading to an experimental solution of plastic flow problems by the direct measurement of elasto-plastic deformations. For example, the steady-state creep of complex components under compound loads can be studied by measuring the elasto-plastic deformations of a similar body at normal temperature. A variational theorem, Eq.(2.13) distinguishes the true solution and makes possible the application of the Ritz method to approximate the solution of complex problems. Referring to the works of V. Prager and F. Hodge and of V. V. Sokolovskiy, the solutions of some three-dimensional problems are discussed.

1. The flow of a thin layer between rigid surfaces.

Card 3/5

Certain problems in the theory of plastic flow. 24-2-10/28

An effective lubricant or coating reducing the friction in the hot forming process proportionally reduces the required power of the press.
2. The forming of thin cylindrical shells (including ribbed shells) by extrusion from a prismatic pressure cylinder through a die slot. An appropriate cross-section of the cylinder is sought to yield the lowest extrusion pressure and to achieve constant wall thickness. The sand heap analogy is used to visualise the extrusion process and is shown to give valid solutions to the problems set. The flow of a plastic layer between rough plates accompanied by heat exchange is examined when the shear resistance of the material is assumed to depend solely on temperature. The thickness of the boundary layer practically "frozen" onto the plates is to be found. The proposition is advanced that of all the kinematically possible flows, the real boundary of the frozen layer is distinguished by the condition that the power consumed to maintain the flow is a minimum. This proposition is considered generally valid for all problems of this type. The boundary of "freezing" is determined from an implicit equation (4.41).

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Certain problems in the theory of plastic flow. 24-2-10/28

There are 7 figures, 1 table and 14 references, 13 Russian, 1 English.

SUBMITTED: October 5, 1957.

AVAILABLE: Library of Congress.

Card 5/5

SOV/30-58-6-6/45

AUTHORS: Il'yushin, A. A., Corresponding Member, Academy of Sciences, USSR, Lenskiy, V. S., Candidate of Physical and Mathematical Sciences

TITLE: Scientific Foundation of Durability and Plasticity of Solids (Nauchnyye osnovy prochnosti i plastichnosti tverdykh tel)

PERIODICAL: Vestnik Akademii nauk SSSR, 1958, Nr 6, pp. 49 - 55 (USSR)

ABSTRACT: Mechanics is to be considered as one of the most important developmental foundations of engineering. Many recent achievements in the field of physics were rendered possible only due to mechanics. Many academic and scientific branch institutes of investigation, as well as universities work on the solution of the problem of solidity and plasticity. Soviet Science achieved important successes in this field. In spite of this fact science is not able in its present state to give a satisfactory answer to a series of important problems of engineering, industry and natural science. The insufficient working out of the theoretical problems of metalworking by means of pressure, as well as of the mechanism of metal de-

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SOV/30-58-6-5/45

Scientific Foundation of Durability and Plasticity of Solids

formation from the semiproduct to the finished product under various thermo-mechanical conditions may be given as example. The backwardness in this field makes the process of the production of metals and alloys with required thermo-mechanical characteristics difficult. 3 main trends may be outlined with respect to the working out of the solidity- and plasticity problems. The working out of formulae dealing with the connection between stresses, deformations, time and temperature, as well as the determination of the conditions of destruction of solids, both under singular and repeated stresses are the first and most important line to be determined. The second working cycle deals with the general methods of solving the mechanical problems of a deforming solid, the working out of the theoretical foundations for the engineering calculation methods for solidity and stability and deformability, as well as the experimental methods of the investigation of the solidity of structures, machines and plants. The calculation of the stresses occurring during welding may be designated as concrete technical task. The third cycle of investigation deals with the physical mechanisms of the deformation of solids. The theoretical and experimental in-

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vestigation of atomic-molecular mechanisms of the plastic processes in the deformation of material of solids under different physical and physical and chemical conditions is required here. A physical explanation of the behavior of the material up to its destruction with rapidly changing stresses as impact, or explosion respectively, as well as at different temperature conditions ought to be obtained as results of these investigations. The training of specialist cadres in the field of solidity and plasticity ought to be intensified. The already existing laboratories must be extended and new ones must be built. New constructions and test machines, plants, test stands and measuring apparatus must also be built. The extension of the international scientific contacts, especially on the problems of experimental techniques, is also required.

1. Solids--Deformation 2. Plasticity--Theory

Card 3/3

SOV/24-58-12-13/27

AUTHOR: Il'yushin, A.A., (Moscow)
Ogibalov, P.M.

TITLE: The Plastic Deformation of a Thick-Walled Tube Under the Action of Heat Impulses and Pressure (O plasticheskikh deformatsiyakh tolstostennoy truby pod deystviyem teplovykh impul'sov i davleniya)

PERIODICAL: Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 12, pp 85-89 (USSR)

ABSTRACT: When a tube is subjected internally to impulses of heat and pressure, for example, from a jet of hot gas, a thin layer of the material adjacent to the inner surface of the tube will be heated and cooled. Approximate consideration of the basic heat conduction equation shows that the thickness (δ) and the maximum temperature (V_0) of the layer will be of the order of

$$\delta = \sqrt{\frac{2\lambda T}{c\gamma}} , \quad V_0 = Q_0\sqrt{\frac{2T}{c\gamma\lambda}} \qquad (8)$$

where λ is the thermal conductivity, c the heat capacity and γ the density of the tube material, T is

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The Plastic Deformation of a Thick-Walled Tube Under the Action of Heat Impulses and Pressure

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the duration of the heat impulse and Q_0 is the mean flow of heat from the gas to the tube. For a steel tube, the equations reduce to

$\delta = 5.45 \sqrt{T}$ mm (T in seconds),

$V = 3620\ Q_0 \sqrt{T}$ deg. (Q_0 in k cal/cm^{2}sec),

or, for $T = 0.01$, $\delta = 0.54$ mm and for $Q_0 = 2$, $V_0 = 724$°C. On the basis of these estimates, it is shown that in the heating period, the axial and tangential strains, which are predominantly of thermal origin, are compressive and are of the order of 1%, whereas in the cooling period, the strains are tensile and are also of the order of 1%. In each case, the strains are above the respective plastic limits and, on subjecting the tube to repeated thermal and pressure cycles, it may fail by fatigue.

SUBMITTED: 24th September 1957.

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24(6) PHASE I BOOK EXPLOITATION SOV/3041

Il'yushin, Aleksey Antonovich, and Viktor Stepanovich Lenskiy

Soprotivleniye materialov (Strength of Materials) Moscow, Fizmatgiz, 1959. 371 p. Errata slip inserted. 15,000 copies printed.

Ed.: I. K. Snitko; Tech. Ed.: S. N. Akhlamov.

PURPOSE: This textbook is intended for students in advanced courses on the strength of materials.

COVERAGE: This book deals with the following topics: 1) fundamental concepts of deflections, internal stresses, deformations, actions of internal forces, and the process of loading a small element of a solid body; 2) the basic mechanical properties of solid bodies, such as elasticity and ideal plasticity, flow, creep and relaxation, viscosity and dynamic strength, and fatigue and failure; 3) basic kinematic and geometric hypotheses intended to simplify the mathematical statement of problems dealing with stresses, deformations, displacements, and failures of

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solid bodies subjected to external effects, as well as the basic equations and methods for solving problems of deformation and strength of bodies. According to the author, the methods for calculating strength of materials presented in the book differ from the stricter methods based on the theory of elasticity and plasticity. A number of simplifying assumptions of a kinematic and geometric character have been introduced. No personalities are mentioned. There are no references.

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Ilyushin, A.A.

28(1) PHASE I BOOK EXPLOITATION SOV/2156

Soveshchaniye po kompleksnoy mekhanizatsii i avtomatizatsii tekhnologicheskikh protsessov. 2nd, 1956.

Avtomatizatsiya mashinostroitel'nykh protsessov; /trudy soveshchaniya/, tom. 1: Goryachaya obrabotka metallov (Automation of Machine-Building Processes; Proceedings of the Conference on Over-All Mechanization and Automation of Technological Process, Vol 1: Hot Metal-Forming) Moscow, 1959. 394 p. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya. Komissiya po tekhnologii mashinostroyeniya.

Resp. Ed.: V.I. Dikushin, Academician: Compiler: V.M. Raskatov: Ed. of Publishing House; V.A. Kotov; Tech. Ed.: I.F. Kuz'min.

PURPOSE: The book is intended for mechanical engineers and metallurgists.

COVERAGE: The transactions of the Second Conference on the Over-All Mechanization and Automation of Industrial Processes, September 25-29, 1956, have been published in three volumes. This book, Vol. I, contains articles under the general title, Hot Working of Metals. The investigations described in the book were conducted by the Sections for Automation and Hot Working of Metals, under the direction of the following scientists: casting - P.N. Aksenov, D.P. Ivanov and G.M. Orlov; forming - A.I. Tselikov, A.D. Tomlenov and V.T. Meshcherin; welding - G.A. Nikolayev, B.I. Frolov and G.A. Maslov. There are 183 references: 142 Soviet, 34 English, 6 German, and 1 French.

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S/179/59/000/06/015/029
E081/E141

AUTHORS: Il'yushin, A.A., and Ogibalov, P.M. (Moscow)

TITLE: Action of High Pressure in Strengthening a Hollow Cylinder

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1959, Nr 6, pp 110-112 (USSR)

ABSTRACT: The flow limit (τ_s) for metals under hydrostatic pressure (σ) is given by

$$\tau_s = \tau_0 S(\sigma) \qquad (1)$$

where τ_0 is the flow limit in shear when $\sigma = 0$. Assuming a linear approximation, the function $S(\sigma)$ can be written

$$S(\sigma) = 1 - \delta(\sigma/\tau_0) \qquad (\delta > 0) \qquad (2)$$

where δ is a constant. The solution of Lamé's problem for a tube under the influence of internal pressure leads to expression (3) for the hydrostatic pressure and for the maximum shear stress. The strengthening coefficient is defined as the ratio

$$_{\sigma}(\delta) = \frac{(p)_{\delta \neq 0}}{(p)_{\delta = 0}} = \frac{b^2}{b^2 + pm^2} < 1 \qquad (6)$$

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Action of High Pressure in Strengthening a Hollow Cylinder

where p is the internal pressure under which flow begins at the internal surface of the cylinder. Using the linear approximation, an expression (Eq 16) is obtained for η in the case of the hollow cylinder; numerical substitution in this expression with $b/a = e = 2.71828$ (b = external radius of the tube, a = internal radius) and $\delta = 0.3$, leads to the value $\eta = 2.27$. The strengthening effect in this case is therefore substantial.

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There are 1 table and 2 Soviet references.

SUBMITTED: June 29, 1959

Il'yushin, A. A.

PHASE I BOOK EXPLOITATION SOV/4946

Mikhaylov, A. A., ed.

Stantsii v kosmose; sbornik statey (Space Stations; Collection of Articles) Moscow, Izd-vo AN SSSR, 1960. 444 p. 25,000 copies printed. (Series: Akademiya nauk SSSR. Nauchno-populyarnaya seriya)

Resp. Ed.: A. A. Mikhaylov; Compiler: V. V. Fedorov; Ed. of Publishing House: Ye. M. Klyaus; Tech. Ed.: I. D. Novichkova.

PURPOSE: This book is intended both for the space specialist and the average reader interested in space problems.

COVERAGE: The book contains 73 short articles by various Soviet authors on problems connected with space travel and the launching of artificial earth satellites and space rockets. Some possibilities of future developments are also discussed. The articles were published in the period of 1957-1960. No personalities are mentioned. There are no references.

III. ARTIFICIAL PLANET. FIRST ROCKET ON THE MOON

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Barabashov, N. P., Active Member of the Academy of Sciences UkrSSR. Artificial Earth Satellites and the Problem of Outer Space Flights [May 1959] 259

Kukarkin, B. V., Doctor of Physical and Mathematical Sciences. Launching of Space Rockets and Astronomical Problems [March 1959] 264

TASS Information. Launching of a Space Rocket to the Moon by the Soviet Union [September 13, 1959] 267

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Ilyushin, A.A.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics,
Moscow, 27 Jan - 3 Feb '60.

134. A. A. Il'yushin (Moscow): Problems of the theory of plasticity [illegible] loading.

135. V. K. Kabulov (Tashkent): Elastic-plastic vibrations of rods of non-circular cross section.

136. V. G. Kalinin (Leningrad): The forced non-linear flexural vibrations of a homogeneous prismatic rod and a very long rectangular plate.

137. S. Kaliski (Warsaw): On a method of solving the equations of motion for an infinite anisotropic medium in the presence of a magnetic field.

138. S. N. Kan, F. A. [illegible] (Kharkov): An engineering method for the design of open prismatic shells.

139. I. I. Kandaurov (Leningrad): The distribution of vertical compressive stresses and strains in foundations in homogeneous or stratified soils.

140. B. Ya. Kantor (Kharkov): Bending of cantilever plates of variable stiffness.

141. K. S. Karapetyan (Erevan): The effect of aging and anisotropy on the creep of concrete.

142. L. M. Kachanov (Leningrad): On the time of rupture in creep.

143. L. M. Kachanov (Leningrad): On some variational principles and methods in the theory of plasticity.

144. K. A. Kerimov (Baku): A procedure of determining an impact tension diagram for large deformations.

145. N. A. Kil'chevskii (Kiev): Some generalizations of the formulation of elastostatic and elasto-dynamic contact problems and methods for their solution.

146. A. Kh. Kim (Omsk): The flow of a visco-plastic medium in a cone.

147. L. A. [illegible] (Leningrad): On the elastic equilibrium of thin, infinite orthotropic plates.

148. K. V. [illegible] (Kharkov): Models of the influence surfaces for the intensity of the bending moment in thin plates and shells.

149. A. D. Kovalenko (Kiev): Shallow shells of revolution of variable thickness in a three-dimensional temperature field.

150. K. Kozarov (Sofia): Dynamic stability of cylindrical and spherical shells.

151. M. Kozarov (Sofia): The influence of initial imperfections of shape on the stability of thin elastic cylindrical sandwich shells under axial compression.

152. W. T. Koiter (Delft): Elastic stability and post-buckling behavior.

153. A. A. [illegible] ([illegible]), Yu. P. [illegible] ([illegible]): The effect of support elasticity on the natural vibrations of rods.

154. I. M. [illegible], I. A. Oding (Moscow): Strength and plasticity of "whiskers".

155. B. G. Korenev (Moscow): The design of flexible plates and beams on elastic foundation.

156. M. S. Kornishin (Kazan): Bending of rectangular shallow shells with elastic ribs.

~~157. [illegible] ([illegible]): On the solution of the nonlinear~~ algebraic equations of shell theory.

158. V. N. [illegible], P. M. [illegible] (Leningrad): The one-dimensional problem of the consolidation of a sediment layer with variable specific weight and variable water permeability.

~~159. [illegible] ([illegible]): The elastic equilibrium of~~ anisotropic plate with a finite number of elliptical holes.

160. Yu. I. Kosterin (Yaroslavl), I. V. Kragel'skii (Moscow): Rheological phenomena in dry friction.

161. Yu. V. [illegible] (Stalinsk): Lateral stability of coupled arches with double curvature.

162. A. I. [illegible] (Leningrad): On the theory of plane plastic stress.

163. V. N. Kukudzhanov, L. V. Nikitin (Moscow): Propagation of elastic, visco-plastic waves in bars.

164. [illegible] (Tbilisi): The investigation of contact problems in the theory of elasticity by the method of coupled integral equations.

165. B. V. [illegible] (Moscow): The investigation of the deformation of grains on metals by the X-ray method.

166. A. Langenbach (Berlin): Application of the non-linear variational principle to some problems of the theory of elastic-plastic strains.

167. S. M. Levi (Moscow): The investigation of rheological properties of gelatin solutions.

ILYUSHIN, A. A.

PHASE I BOOK EXPLOITATION . SOV/4000

SOV/12-M-27

Akademiya nauk SSSR. Institut mekhaniki

Inzhenernyy sbornik, t. 27 (Engineering Collection, Vol. 27) Moscow, Izd-vo AN SSSR, 1960. 210 p. 2,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk.

Resp. Ed.: A. A. Il'yushin; Ed.: V. M. Akhundov; Ed. of Publishing House: V.M. Akhundov; Tech. Ed.: A.P. Guseva.

PURPOSE: This book is intended for engineers, applied physicists, and applied mathematicians.

COVERAGE: The book consists of 24 articles on such problems as wing theory, supersonic flow, theory of shells, stability, plasticity and elasticity, the bending of thin plates and shells, and various aspects of applied mathematics. No personalities are mentioned. References accompany most of the articles.

Filinov, M.V. On the Problem of Displacing Gas by Water 54

Bolotin, V.V. Application of Statistical Methods for the Evaluation of the Strength of Structures Subjected to Seismic Forces 58

Movchan, A.A. The Behavior of Complex Eigen Values in the Problem of Panel Flutter 70

Slobodkin, A.M. Stability of an Elastic Beam With Rigid Appendage in Supersonic Flow 77

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Volkov, A.N. "Contact Method" in the Coupling of a Cylindrical Shell of Open and Closed Profile 177

Burmistrov, Ye.F. Symmetric Bending of Nonhomogeneous and Homogeneous Orthotropic Shells of Revolution Taking Into Account Large Deflections and an Uneven Temperature Field 185

[illegible], S.S. Lower Limit of a Kinematically Maximum Admissible Load 200

Levit, D.D. Nomographic Solution of Equations of the Fourth and Fifth Degrees 205

Stepanov, R.D. Application of the Method of Asymptotic Integration to the Solution of the Equation of the Natural Vibrations of Shells 209

AVAILABLE: Library of Congress

(15)

Name : IL'YUSHIN, A. A.

Title : Corresponding Member of the USSR Academy of Sciences.

Remarks : A. A. IL'YUSHIN is the author of an article entitled "Ahead of Us is the Flight of Man" dealing with the preparations of sending a human being to the Moon.

Source : M: Stantsii v Kosmose (Stations in Outer Space), a collection of articles, published by the USSR Academy of Sciences, Moskva, 1960, with foreword by Academicians A. N. Nesmeyanov and A. V. Topchiyev, p. 280.

80 10

~~ILYUSIN~~, A. A. (USSR Academy of Sciences, Moscow)

ILYUSHIN, A. A.

"On a Statement and a Solution of a Three-Dimensional Problem of the Nonlinear Elasticity Theory."

report submitted for the Xth International Congress of Applied Mechanics, Stresa, Italy, 31 Aug - 7 Sep 60.

IL'YUSHIN, A.A. (Moskva)

Problems of the general theory of plasticity. Prikl. mat. i mekh.
24 no.3:399-411 My-Je '60. (MIRA 13:10)
(Plasticity)

82493

16.7300

S/040/60/024/04/08/023
C 111/ C 333

AUTHOR: Il'yushin, A. A. (Moscow)

TITLE: On the Increase of the Plastic Deformation and on the Flow Surface

PERIODICAL: Prikladnaya matematika i mekhanika, 1960, Vol. 24, No. 4, pp. 663-666

TEXT: Let a body be balanced under the influence of the system of forces Q_M. Now let the body be slowly exposed to an additional system of forces ΔQ_M which then is slowly removed. The work done on the (with respect to the variation of forces) closed cycle of the system ΔQ_M is positive according to Drucker (Ref.1). The author of the present paper investigates the rigorous theoretical conclusions of this postulate of Drucker. He states that the convexity of the flow surface and the coincidence of the normal of the flow surface with the vector of growth of the plastic deformation in general do not follow from the above postulate. These properties are valid only if under arbitrary load the plastic deformation proceeds without obvious variation of the elastic properties. Generally it follows from the postulate of Drucker that

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On the Increase of the Plastic Deformation and on the Flow Surface

$$\frac{d\bar{e}^p}{ds} + (\mathcal{E})'\bar{\sigma} = G \cdot \mathrm{grad}\, f \quad , \tag{10}$$

where $\bar{\sigma}$ is the stress, $f(\bar{\sigma}) = 0$ the equation of the flow surface, $\bar{e}^p$ the plastic deformation, $ds = |d\bar{\sigma}|$ and $(\mathcal{E})'$ the derivative of the matrix of the coefficients of elasticity.

There are 2 references: 1 Soviet and 1 American.

SUBMITTED: April 2, 1960

Card 2/2

IL'YUSHIN, Aleksey Antonovich; OGIBALOV, Petr Matveyevich; KONDRASHKOVA, S.F., red.; YERMAKOV, N.S., tekhn.red.

[Elastoplastic deformations of hollow cylinders] Uprugo-plasticheskie deformatsii polykh tsilindrov. Moskva, Izd-vo Mosk. univ., 1960. 224 p. (MIRA 14:4)
(Elastic plates and shells)

27797

S/508/60/028/000/010/022
D237/D305

21.2200

AUTHORS: Il'yushin, A.A., and Ogibalov, P.M. (Moscow)

TITLE: Hardness of a thick walled cylindrical shell and a hollow sphere under the influence of radiation

PERIODICAL: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk. Inzhenernyy sbornik, v. 28, 1960, 134 - 144

TEXT: Irradiated solids exhibit volume deformation θ and changes in elastic and plastic properties. A neutron passing through a crystal lattice causes thermal or dislocation effects, and in case of neutron nucleus interaction produces fission. A homogeneous isotropic body occupying a semi space $z \geqslant 0$ is considered. If the intensity of a normal neutron beam of ε mean energy on $z = 0$ is I_0 n/cm² sec., then at z = const.

$$I(z) = I_0 e^{-\mu z} \text{ n/cm}^2\text{. sec.} \qquad (1)$$

where

$$\mu = \sigma n_0 = \sigma(A_0 \rho / A) \qquad (2)$$

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and is of the order cm^{-1} and where σ - effective nuclear cross section, ρ - density, A - atomic weight, A_0 - Avogadro's number, n_0 - number of nuclei in 1 cc. If I_0 is independent of time then

$$t \cdot I(z) = I_0 \cdot te^{-\mu z}. \qquad (5)$$

It has been shown experimentally that on irradiation, the elasticity modulus change is 1.5 - 5 %, while hardness and critical stress values are affected to a greater degree. For a solid with a plane surface, the number of neutrons at the depth z in time t is

$$(nvt)_z = nvt \cdot e^{-\mu z} \qquad (6)$$

and hence $\sigma_s = \sigma_s(z)$ and $G = G(z)$. If it is assumed that $G = G(nvt)$ $\sigma_s = \sigma_s(nvt)$, then

$$G = G(Ne^{-\mu z}), \ \sigma_s = \sigma_s(Ne^{-\mu z}). \qquad (7)$$

In the case of a cylindrical shell (6) becomes

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$$N_r = N \frac{a}{r} e^{-\mu(r-a)} \tag{8}$$

and for the hollow sphere

$$N_r = N \frac{a^2}{r^2} e^{-\mu(r-a)}. \tag{9}$$

Using the theory of elastic shells the author then obtains intensity of deformation e_i at the distance z from the inner surface as

$$e_i = \frac{2}{\sqrt{3}} \sqrt{P_\varepsilon - 2zP_{\varepsilon x} + z^2 P_x}, \tag{12}$$

and stress intensity

$$\sigma_i = 3Ge_i \tag{13}$$

where P, P_x, $P_{\varepsilon x}$ are known quadratic forms for ε and x. If the stream N is incident from the direction [illegible] the inner surface z =

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= + $\frac{h}{2}$ where h = thickness of the shell, then for the layer z = const.

$$N_z = Ne^{-\mu(\frac{h}{2} - z)} \qquad (14)$$

and by (7)

$$T = \sigma_s(N_z) - 3Ge_i = \sigma_s[Ne^{-\mu(\frac{h}{2} - z)}] - 2\sqrt{3}G\sqrt{P_\varepsilon - 2zP_{\varepsilon x} + z^2P_x}. \qquad (15)$$

Let p be a load parameter and

$$P_\varepsilon = p^2\bar{P}, \quad P_x = p^2\bar{P}_x, \quad P_{\varepsilon x} = p^2\bar{P}_{\varepsilon x}. \qquad (16)$$

Then

$$T \doteq \sigma_s[Ne^{-\mu(\frac{h}{2} - z)}] - 2\sqrt{3}Gp\sqrt{P_\varepsilon - 2z\bar{P}_{\varepsilon x} + z^2\bar{P}_x},$$

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Hardness of a thick ...

and T = T(α, β, z; p). The problem of finding the value of p_*, for which flow occurs, i.e. $\sigma_1 = \sigma_s$ at any point of the shell M^* (z = $= z_*$, $\alpha = \alpha_*$, $\beta = \beta_*$) is then stated and the solution when $\frac{\partial N}{\partial \alpha} = \frac{\partial N}{\partial \beta}$ = 0, is

$$p_* = \frac{\sigma_s(N_{z_*})}{2\sqrt{3}\, G\sqrt{\overline{P}} - 2z_*\overline{F}_x + z^2\overline{P}_x} \quad (23)$$

For M^* on the surface $z = \pm h/2$ the problem is solved by putting [illegible] = 0. A hollow cylinder is considered next, whose inner and outer radii are a and b respectively, subject to radial outward directed radiation N, resulting in the inner pressure p. $\overline{p}$ is sought, for which a plastic deformation first occurs. G is assumed constant. There are 4 figures, and 14 references: 10 Soviet-bloc and 4 non-Soviet-bloc. The references to the English-language publications read as follows: Snyder, [illegible]oufeld, Disordering of Solids by Neutron Radiation, Phys. Rev., vol. 97, no. 1636, 1955; H. Kierstead,

Card 5/6

27792

Hardness of a thick ... S/508/60/028/000/010/022
D237/D305

Expansion of Copper Bombardment by 19-Mev deuterons, Bull. Amer. Phys. Soc., vol. 29, no. 7, 1954; J.A.Brinkman, On the nature of radiation damage in metals, J. Appl. Phys., vol. 25, no. 961, 1954; J.C. Wielson, R.G. Berggren, Effects of neutron irradiation in steel, Pros. A.S.T.M., vol. 55, 1966, p. 689-707.

SUBMITTED: May 27, 1959

Card 6/6

PHASE I BOOK EXPLOITATION SOV/5455

Il'yushin, Aleksey Antonovich, and Petr Matveyevich Ogibalov

Uprugo-plasticheskiye deformatsii polykh tsilindrov (Elastic-Plastic Deformations of Hollow Cylinders) [Moscow] Izd-vo Mosk. univ., 1960. 224 p. Errata slip inserted. 4,000 copies printed.

Ed.: S. F. Kondrashkova; Tech. Ed.: M. S. Yermakov.

PURPOSE : This book is intended for scientists and engineers, and for advanced students and aspirants concerned with problems in structural mechanics.

COVERAGE: The book is primarily concerned with various effects and possible methods of strengthening thick-walled cylinders. Methods involving strengthening through elastic-plastic autofrettage, nonuniformity of the material, nonuniform heating through the thickness, the action of high pressure and exposure to penetrating radiation are considered. Attention is given to problems pertaining to repeated loads and dynamic

Card 1/5

BOGATYREV, I.S. (Moskva); IL'YUSHIN, A.A. (Moskva); LENSKIY, V.S. (Moskva);
PANFEROV, V.M. (Moskva)

The SN testing machine for investigating plastic deformations of metals under composite loading. Inzh.zhur. 1 no.2:182-193 '61.
(MIRA 14:12)

(Testing machines) (Metals--Testing)

IL'YUSHIN, A.A.; POZDEYEV, A.A.; TARNOVSKIY, I.Ya.; TARNOVSKIY, V.I.

Applying the method of hydrodynamic approximations to variational problems of plastic flow. Inzh.zhur. 1 no.4:59-67 '61. (MIRA 15:4)

(Plasticity)

IL'YUSHIN, A.A.

Fundamentals of the general mathematical theory of plasticity [with summary in English]. Vest. Mosk. un. Ser. 1: Mat., mekh., 16 no.3:31-36 My-Je '61. (MIRA 14:7)

1. Kafedra teorii uprugosti Moskovskogo universiteta.
(Plasticity)

IL'YUSHIN, A.A. (Moskva)

Postulate of plasticity. Prikl. mat. i mekh. 25 no.3:503-507 My-Je '61. (MIRA 14:7)
(Plasticity) (Deformations (Mechanics))

IL'YUSHIN, A.A. (Moskva)

More on the postulate of isotroypy. Izv.AN SSSR.Otd.tekh.nauk.
Mekh.i mashinostr no.1:201-204 Ja-F '62. (MIRA 15:3)
(Plasticity)

IL'YUSHIN, Aleksey Antonovich; PSHENICHNOV, G.I., red.izd-va; GOLUB',
S.P., tekhn. red.

[Fundamentals of the general mathematical theory of plasticity]
Plastichnost'; osnovy obshchei matematicheskoi teorii. Moskva,
Izd-vo Akad. nauk SSSR, 1963. 270 p. (MIRA 16:6)
(Plasticity)

/EWP(t)/EWP(b) ASD(f)-2/AST(m)

$S_{ij} = \sigma_{ij} - \sigma$

The deformation is expressed by $\varepsilon_{ij} = \frac{S_{ij}}{2\mu} + $ [illegible]. The deformation rate $\dot{\varepsilon}_{ij}$ is related

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[illegible], and the solutions are given by means of [illegible] stress relaxation [illegible] for which [illegible]

Card 2/

[illegible]

AUTHOR: Il'yushin, A. A. (Moscow); Ogibalov, P. M. (Moscow)

[illegible]

[illegible]

ACC NR: AP7003763 (N) SOURCE CODE: UR/0374/66/000/006/0828/0832

AUTHOR: Il'yushin, A. A.; Ogibalov, P. M.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Criterion of the long-time strength of polymers

SOURCE: Mekhanika polimerov, no. 6, 1966, 828-832

TOPIC TAGS: durability, polymer rheology, creep, tensile strength

ABSTRACT: The paper correlates the phenomenological approaches to the evaluation of durability of polymers by means of dimensional relationships. Formulas are derived for: (1) τ (time to failure) and ϵ (deformation at failure) in the case of creep (tensile stress σ being constant); (2) τ, ϵ and σ in the case of stretching at a constant deformation rate; (3) τ and the magnitude of tensile stress in the case of loading at a constant rate; (4) the breaking number of cycles N of a cyclic (symmetrical) load with a stress amplitude σ = const and frequency ω = const. It is noted that even more precise relationships can be obtained by means of the nonlinear theory of viscoelasticity. Orig. art. has: 16 formulas.

SUB CODE: 11, 20/ SUBM DATE: 13Jul66/ ORIG REF: 009

Card 1/1 UDC: 678:539.374

RUZ, Roman Zakharovich; ARKHIPOV, Ivan Andreyevich; ILYUSHIN,
A.P., red.; EL'KINA, E.M., tekhn. red.

[Organization and technique in the sale of industrial goods]
Organizatsiia i tekhnika torgovli promyshlennymi tovarami.
Izd.2., perer. Moskva, Ekonomika, 1964. 231 p.
(MIRA 17:2)

KASABUTSKIY, Adam Antonovich; DAVYDOV, Viktor Ivanovich;
ILYUSHIN, A.P., red.

[Commercial computing and machine accounting] Khoziaistvennye vychisleniia i mekhanizatsiia ucheta. Moskva, Ekonomika, 1964. 255 p. (MIRA 17:12)

ILYUSHIN, A.R.; PETROV, N.I. (Moskva)

Mechanisms for feeding tag machines with nonperforated tape.
Shvein.prom. no.6:9 N-D '59. (MIRA 13:4)
(Labeling machines)
(Clothing industry--Equipment and supplies)

ILYUSHIN, A.S.

We shall grow tree belts in the tundra. Put' i put.khoz. no.6:38-40
Je '57.
(MIRA 10:7)

1. Nachal'nik otdela zashchitnykh lesonasazhdeniy Pecherskoy dorogi.
(Pechora Basin--Railroads--Snow protection and removal)

ILYUSHIN, G., tekhnispektor.

Certain shortcomings of motion-picture film boxes. Kinomekhanik no.7:37 Jl '53.
(MLRA 6:8)

1. Yakutskaya kontora Glavkinoprokata. (Moving-picture distribution)

IL'YUSHIN, G.T., inzh.

Reducing the cost and speeding up the erection of transmission lines. Elek. sta. 29 no.4:42-43 Ap '58. (MIRA 11:8)
(Electric lines--Overhead)

IL'YUSHIN, I.

With the wide cooperation of the public. Sov.foto 20 no.1:17 Ja '60. (MIRA 13:5)

1. Ministr prosveshcheniya BSSR.
(Photography--Study and teaching)

[illegible], [illegible]; [illegible], [illegible]
[illegible], V.[illegible], inzh.; [illegible], [illegible]

Purifying the waste waters of alkylation plants with centrifugal separators. Khim. i neft. mashinostr. no.4:9-10 O '64.
(MIRA 17:12)

ILYUSHIN, I.I.

Systematically improve the quality of leather. Kozh.-obuv.prom. 7 no.3:3-5 Mr '65. (MIRA 18:10)

1. Direktor Kozhevennogo zavoda imeni Fol'mann.

MALININ, S.N., dotsent, kand.ekon.nauk, otv.red.; LUPINOVICH, I.S., doktor sel'skokhoz.nauk, akademik, zamesttitel' otv.red.; URUSOV, V.V., otv.red. po vypusku; LUKASHEV, K.I., doktor geologo-mineral.nauk, akademik, red.; AVKSENT'YEV, A.N., kand.geologo-mineral.nauk, red.; ROGOVOY, P.P., doktor sel'skokhoz.nauk, akademik, red. Sostaviteli kart: BOBYLEVA, Ye.A.; VOLKOVA, V.V.; VORONTSOVA, G.V.; MARKOVA, N.T.; TIKHONRAVOVA, Ye.V.. IL'YUSHIN, I.M., kand.filosof.nauk, red.kart; KRAVCHENKO, I.S., kand.istor.nauk, red.kart; KUPREVICH, V.F., doktor biolog.nauk, akademik, red.kart; BURZGAL, T.S., red.-kartograf; GULYUK, G.I., red.-kartograf; LEVSHINOV, A.O., red.-kartograf; RUTKOVSKAYA, M.S., red.-kartograf; SVIRSKIY, A.S., red.-kartograf

[Atlas of the White Russian Soviet Socialist Republic] Atlas Belorusskoy Sovetskoy Sotsialisticheskoy Respubliki. Minsk, Akad.nauk BSSR. Glav.upr.geodez. i kartografii MVD SSSR, 1958. XIV, 140 maps. (MIRA 12:4)

1. Predsedatel' Gosplana BSSR (for Malinin). 2. AN BSSR; prezident Akademii sel'skokhoz.nauk BSSR (for Lupinovich). 3. Direktor Minskoy kartograficheskoy fabriki (for Urusov). 4. AN BSSR; vitse-prezident AN BSSR (for Lukashev). 5. AN BSSR (for Rogovoy). 6. Chlen-korrespondent AN BSSR (for Il'yushin). 7. AN BSSR; chlen-korrespondent AN SSSR; prezident AN BSSR (for Kuprevich).

(White Russia--Maps)

LIVCHAK, I.F., doktor tekhn. nauk; USENKO, I.F., inzh.; BEREZIN, M.D.; inzh.;YEVSEYEV, B.S., inzh.; IL'YUSHIN, L.M., inzh.

Using water heating systems with plinth convectors without casing. Vod. i san. tekh. no.3:18-21 '64 (MIRA 18:2)

ILYUSHIN, M.A., inzh.; SHEVCHENKO, G.V., kand. tekhn. nauk

Physical and mechanical properties of veneer treated with bakelite. Sudostroenie 27 no.2:42-44 F '61. (MIRA 16:7)

(Bakelite) (Veneers and veneering)

BANKO, V.P.; DEMIDOVA, L.A.; ILYUSHIN, M.A.; KONDRASHKIN, Ye.P.; kand. tekhn.nauk; MIRKOVICH, R.A.; PLATNIKOVA, G.P.; POROKHIN, A.A., kand. tekhn.nauk; RUMYANTSEVA, O.M.; TEMKINA, R.Z., kand.tekhn.nauk; TIKHONOV, N.F.; SHVARTSMAN, G.M., kand.tekhn.nauk; SHEYDIN, I.A., kand.tekhn nauk; SMIRNOV, A.V., red.; VOLOKHONSKAYA, L.V., red. izd-va; BACHURINA, A.M., tekhn.red.

[Veneerer's handbook] Spravochnik fanershchika. Vol.2. 1959. 333 p. (MIRA 13:3)

1. TSentral'nyy nauchno-issledovatel'skiy institut fanery i mebeli.
(Veneers and veneering)

GERASIMOV, V.N.; KURYNDIN, V.F.; ILYUSHIN, N.F.

Automatic groove milling machine. Mashinostroitel' no.6:10-11
Je '64. (MIRA 17:8)

IL'YUSHIN, N.F., inzh.

Six-spindle turret drill head. Mashinostroenie no.4:37 Jl-Ag '65.
(MIRA 18:8)

ILYUSHIN, S.V.; IPATOVA, S.I.; KONOVALOV, F.S.; LORENTSSON, I.G.; MARSHAK, I.S.;
MESHKOV, V.V.; NILENDER, R.A.; PLOKHOTSKIY, Ye.S.; SOKOLOV, I.I.
SOUSTIN, V.F.; TSVETKOV, G.M.; YANI, A.K.

Viktor Nikolaevich Fomin, 1904- ; on his 60th birthday. Svetotekhnika 10 no.11:30 N '64. (MIRA 17:12)

L 05841-67 EWT(d)/EWT(m)/EWP(w)/EWP(v)/EWP(k)/EWP(h) IJP(c) EM

ACC NR: AP6026985 SOURCE CODE: UR/0084/66/000/008/0002/0006

AUTHOR: Il'yushin, S. V. (Chief designer in aviation technology; Lenin prize winner; Twice hero of socialist labor)

ORG: none

38
B

TITLE: For long-distance flights

SOURCE: Grazhdanskaya aviatsiya, no. 8, 1966, 2-6.

TOPIC TAGS: AIRCRAFT PRODUCTION, aircraft design, ~~[illegible]~~ passenger aircraft, aircraft equipment/IL 62 aircraft 26

ABSTRACT: International airlines are now getting the second generation of jet passenger transports. The Il 62, a second-generation airliner, is a long-range air transport with a maximum passenger capacity of 186, which is presently undergoing extensive flight testing and evaluation. It has four rear-mounted ducted-fan engines designed by N. D. Kuznetsov. The engines were built and tested at the aircraft-engine plant and sent to the aircraft plant as completed units, which is a new procedure in aircraft building. The aircraft has 4 main integral/wing fuel tanks and three auxiliary tanks. A detailed description of the Il 62 is given, including its specifications, systems, and instrumentation. Orig. art. has: 12 figures. [SA]

SUB CODE: 01 / SUBM DATE: none/

Card 1/1 eqb

KHOTIMSKIY, Ye., sud'ya vsesoyuznoy kategorii; ILYUSHIN, V., sud'ya
respublikanskoy kategorii

At a judges' seminar. Voen.znan. 39 no.9:28 S '63. (MIRA 16:10)

NEKRASOV, N.; ILYUSHIN, V., sud'ya respublikanskoy kategorii (Moskva)

Baton of skill. Voen. znan. 40 no.10:29-30 O '64.

(MIRA 17:12)

1. Predsedatel' Pervomayskogo rayonnogo komiteta Vsesoyuznogo dobrovol'nogo obshchestva sodeystviya armii, aviatsii i flotu, Moskva (for Nekrasov).

ILYUSHIN, V., master sporta

Transition to the "standard." Voen. znan. 41 no.2:42 F '65. (MIRA 18:3)